M·H

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : A23B 4/04, A23L 3/005 — A1

(11) International Publication Number: **WO 00/04786**

(43) International Publication Date: 3 February 2000 (03.02.00)

(21) International Application Number: PCT/AU99/00573

(22) International Filing Date: 15 July 1999 (15.07.99)

(30) Priority Data:
PP 4753 20 July 1998 (20.07.98) AU

(71) Applicant *(for all designated States except US)*: BYRON AUSTRALIA PTY. LTD. [AU/AU]; 19A Boundary Road, Rushcutters Bay, NSW 2011 (AU).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: LEWIS, Victor, Marcus [AU/AU]; 19A Boundary Street, Rushcutters Bay, NSW 2011 (AU). LEWIS, David, Adrian [AU/AU]; 19A Boundary Street, Rushcutters Bay, NSW 2011 (AU). LEWIS, Deborah, Ann [AU/AU]; 19A Boundary Street, Rushcutters Bay, NSW 2011 (AU).

(74) Agents: STEARNE, Peter, A. et al.; Davies Collison Cave, Level 10, 10 Barrack Street, Sydney, NSW 2000 (AU).

(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: IMPROVED QUICK-COOK DEHYDRATED VEGETABLES

(57) Abstract

Quick-cooked dehydrated vegetables having a moisture content of about 12 % or less which have been compressed, but maintain a substantially intact cellular structure, and which on being placed in water at a temperature of 90 °C to 100 °C are capable of rehydration substantially to their original fresh dimensions, and are of edible tenderness and texture instantly or within five minutes, are described. Also described are processes for the production of a dehydrated, rapidly rehydrating vegetable product by compression of a partially dehydrated vegetable product.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

Improved Quick-Cook Dehydrated Vegetables

Field of the Invention

This invention relates to quick cooking vegetables, more particularly quick cooking dehydrated vegetables.

Background of the Invention

Dehydrated vegetables are important items of commerce. They are processed fresh vegetables in shelf-stable form and are used extensively in the food industry, particularly to provide colour, flavour and nutritional benefits to a wide variety of dry packaged foods.

In the packaged food industry they are especially important in cup soups, cup noodles and in packaged rice and pasta dishes. These are convenience products and quick cook times are regarded as important. In many products the cooking directions call for the addition of boiling water only, without further cooking. The use of vegetables in these products may require the use of expensive freeze-dried vegetables, or else very small dehydrated vegetable pieces. As the hot product may take about two to three minutes to cool sufficiently to be comfortable to consume, it is desirable that the vegetables be sufficiently rehydrated within this time. Conventional dehydrated vegetables, even small pieces, are usually still hard and gritty after three minutes due to incomplete rehydration. Freeze-dried vegetables are expensive and often still spongy in texture after two to three minutes. For products cooked in the microwave or on stove top, a desirable cook time is as short as possible, preferably below five minutes. It is therefore highly desirable to have an economical dehydrated vegetable component that rehydrates quickly enough to be pleasant to consume after boiling water is added and allowed to stand for two to three minutes, and rehydrates back to a natural tasting piece of vegetable.

Alternate quick-cooking dehydrated vegetables such as solute added products (United States 4683141) or puffed vegetables (United States 3038813) have been described, but neither appear to give products sufficiently quick-cooking for many convenience packaged foods.

The term "vegetable" as used in this application refers to fresh or frozen fleshy vegetables such as carrots, peas, peppers, tomatoes, sweet corn and such, but does not refer to dry products of vegetable origin such as wheat, corn, dry legumes and such, and dried fruits such as apple.

United States 3408209 describes subjecting explosion puffed vegetables as described in United States 3038813 and compressing them for the purpose of reducing their bulk for packaging purposes. There is no claim that this process reduces cooking time.

There is a need for a dehydrated vegetable product with a cook time of from instant to about five minutes, which is not gritty, has a pleasant texture and mouth feel, and is inexpensive to prepare. It is to be understood that cook time refers to the time at which the vegetable piece is substantially rehydrated to its size prior to dehydration and is free from hard or gritty centres.

The result may be achieved by mechanically compressing partially dehydrated vegetable pieces, as by passing between the rolls of a roller mill or by other means, to an extent whereby the pieces are noticeably flattened, but not to such an extent that the texture of the rehydrated product is unacceptably altered from that of a rehydrated vegetable piece which had not been compressed. The vegetable is then further dried to a moisture content of about 5% or lower, or in the case of intermediate moisture products, to a higher level. Surprisingly, the compressed vegetable pieces, when rehydrated, return to much the same size and shape as the original pieces prior to initial dehydration but in a significantly shorter time than untreated dehydrated vegetables.

Summary of the Invention

In one aspect, this invention provides a dehydrated vegetable product which comprises a vegetable piece having a moisture content of about 12% or less which has been compressed preferably in one dimension but still has a substantially intact cellular structure, and which on being placed in water at a temperature of 90°C to 100°C is capable of rehydration

substantially to its original fresh dimension and is of edible tenderness and texture instantly or within five minutes.

In another aspect, this invention provides a dehydrated vegetable product prepared by partially dehydrating vegetable pieces to a moisture content from about 8% to about 30%, compressing the vegetable pieces, and thereafter further dehydrating the vegetable pieces to a moisture content of about 12% or lower.

In a further aspect, the invention provides a process for the preparation of a dehydrated, rapidly rehydrating, vegetable product by compression of a partially dehydrated vegetable product.

Detailed Description of the Invention

This invention is concerned with quick-cooked dehydrated vegetables and in accordance with one aspect of the invention a dehydrated vegetable product which comprises a vegetable piece having a moisture content of about 12% or less which has been compressed but still has a substantially intact cellular structure, and which on being placed in water at a temperature of 90°C to 100°C is capable of rehydration substantially to its original fresh dimension and is of edible tenderness and texture instantly or within five minutes.

In accordance with a further aspect of this invention there is provided a dehydrated vegetable product prepared by partially dehydrating vegetable pieces to a moisture content from about 8% to about 30%, compressing the vegetable pieces, and thereafter further dehydrating the vegetable pieces to a moisture content of about 12% or lower.

The term "vegetable" as mentioned above refers to fleshy vegetables, such as carrots, peas, peppers, tomatoes, sweet corn, onion, squash, chillies, zucchini, mushroom, cabbage, celery, green beans, beetroot, pumpkin, and the like, and including frozen fresh vegetables, but excluding dried products of vegetable origin such as wheat, corn, dry legumes and such, and dried fruits such as apples, apricots and grapes. A "vegetable piece" may comprise a small vegetable in its totality, such as a pea, small tomato, sweet-corn kernels,

mushroom and the like. The term "vegetable piece" also includes a vegetable which has been cut to a size suitable for use in the food industry, for example pieces of 10 x 4 x 4 mm.

In one embodiment, the vegetables may be washed, cut to an appropriate size as needed, optionally blanched and placed in a dehydrator, for example as used to produce dehydrated vegetables. Dehydration may be in hot air, or other forms of dehydration such as vacuum drying may be used. The cut may be dice, slices or julienne style strips. It is preferred that the least (or shortest) dimension should not be more than about 5 mm.

Vegetable pieces are partially dehydrated to a moisture content of about 8% to about 30%, preferably from about 8% to about 20%, more preferably about 8% to about 15%. At these moisture contents, the vegetable pieces, particularly when warm, are reasonably plastic. They are then compressed, preferably by passing through a roller mill similar to that used for flaking grains, or by other means known in the art such as hydraulically between flat plates. The rolls of a mill may be set at a gap between about 0.2 mm to 2.5 mm. The roll gap will depend on the dimensions of the partially dehydrated piece. If the moisture content of the piece is too high, for example greater than 30%, the vegetable may squash on to the rolls of the mill. If it is too dry, for example less than about 8%, it may shatter. The extent or fineness to which the vegetable is rolled will largely determine the cook time of the finished product. If the piece is rolled too finely, the cook time will be almost instant, but the texture may be mushy. The gap between the rolls will be determined by:

(i) thickness of the semi-dehydrated vegetable piece;

(ii) the type of vegetable and the variety;

(iii) the desired cook time;

(iv) the desired texture of the rehydrated product.

Vegetable pieces are compressed, preferably in one dimension, the compression maintaining substantially intact cellular structure such that on rehydration, for example in

water of 90°C to 100°C, it is capable of rehydration substantially to its original fresh (that is non-dehydrated) dimensions over a period of up to five minutes.

Intact cellular structure may be determined in a conventional manner, such as by microscopy of a section.

Dried vegetables which have added solutes can also be prepared in this way, for example, vegetables may contain added solutes in an amount from 0.3% to 10% w/w. The introduction of sugars and salts is described, for example, in Australian Patent No. 532414 or by other methods. Solutes which may be used include salts such as sodium chloride, sodium lactate, and sodium citrate, potassium lactate, or sugars (for example glucose, sucrose, fructose) and others known in the art such as sorbitol. The addition of solutes to the vegetables further accelerates the absorption of water, shortens the cooking time, and may improve the plasticity of the pieces during compression.

After compression, the vegetable pieces will have been flattened to a degree depending on the reduction of cook time required. The vegetable pieces may then be further dehydrated to produce a shelf-stable product. Further dehydration results in the rapid loss of moisture since the compressed product gives up its moisture very rapidly as compared to a piece which has not been compressed. The final moisture content should preferably be of about 12% or lower, such as from about 2% to about 10%, for example, more preferably 4% to 6%.

The compression of the vegetables results in greatly decreased rehydration time of the vegetable piece. Table 1 presents the effect of compression on rehydration time of compressed dehydrated vegetables with and without the addition of solutes, in this case of sodium chloride.

Table 2 shows the effect of the degree of compression during rolling on the cook time and texture of dehydrated onion.

Table 1

Time required for dehydrated vegetables to stand in water at 90° to 100°C to be sufficiently rehydrated and tender to be very acceptable for eating. All vegetables compressed through 0.5 mm roll gap except peas which were rolled through a 1.5 mm gap.

Vegetable Dimensions are before dehydration	**Control Not Rolled**	**Rolled**	**5% Solute Added Rolled**
Tomato 10 mm peeled dice	8 mins	4 mins	2 mins
Onion 10 mm dice	10 mins	3 mins	1½ mins
Red Bell Peppers 8 x 8 mm dice	6 mins	1½mins	1 min
Sweet Corn whole kernels	10 mins	4 mins	3 mins
Green Peas	8 mins	4 mins	3 mins
Carrot 10 x 4 x 4 mm dice	6 mins	3 mins	2 mins

Table 2

Effect of degree of compression on rehydration time of 10 x 10 mm dehydrated onion dice containing 5% salt on standing in water at 90° to 100°C.

Gap Between Rolls	**Rehydration Time**	**Comments**
0.3 mm	below 1 min	Rehydrated pieces mushy, did not re-hydrate to original fresh dimensions
0.5 mm	1 min	Slightly mushy. Some loss of texture
0.8 mm	2½ mins	Crisp but well rehydrated
Unrolled control	10 mins	Well rehydrated

By use of compression as described, varying cook times can be selected for vegetable pieces of almost instant, upwards. The cook time can be varied for each vegetable by adjusting:

1. The initial size of the vegetable piece.
2. The degree of compression.
3. The addition of solutes.

4. The nature of the solutes added.

A further advantage of the compressed vegetables is that they have a greater tendency to float on the surface than traditional dehydrated vegetables. This is probably due to their lower bulk density.

Surprisingly unless compressed to an excessive degree the compressed vegetables exhibit surprisingly a marked ability to rehydrate to the initial shape of the fresh vegetable piece.

Example 1

Onions with a solids content of 14% were peeled and diced, 10x10 mm pieces were dehydrated in a hot air dryer at 70°C to a moisture content of 15%. The partially dried pieces were compressed by passing through a roller mill with a gap of 0.5 mm. The semi-dried onions passed readily through the mill without sticking or shattering. They were then further dried at 60°C to a moisture content of 5%. When placed in a cup with boiling water poured over them, the pieces were sufficiently rehydrated to consume after one and a half minutes.

Example 2

Peeled carrots with a total solids content of 12% were diced into pieces 10 x 4 x 4 mm. The pieces were steam blanched for one minute, then coated with sufficient salt solution to give a salt content in the final product of 5% w/w. The carrot was dehydrated at 70°C in a hot air dryer to a moisture content of 20%. The pieces were compressed by passing through a roller mill with the gap set at 0.4 mm, and then dried further at 70°C to 5% moisture.

When placed in a cup of boiling water and allowed to stand, the carrot pieces were quite tender and sufficiently rehydrated to eat after two minutes.

Dehydrated vegetables with rapid rehydration times can thus be produced by compressing partially dehydrated vegetables for example by passing through the gap of a roller-mill

prior to final dehydration. The increased speed of rehydration can be further increased by the compression of vegetables to which solutes have been added.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A dehydrated vegetable product which comprises a vegetable piece having a moisture content of about 12% or less which during its preparation has been compressed but still has a substantially intact cellular structure, and which on being placed in water at a temperature of 90°C to 100°C is capable of rehydration substantially to its original fresh dimension and is of edible tenderness and texture instantly or within five minutes.

2. A vegetable product according to claim 1 wherein the vegetable is selected from carrots, peas, peppers, tomatoes, sweet corn, onion, squash, chillies, zucchini, mushroom, cabbage, celery, green beans, beetroot, pumpkin, and the like.

3. A vegetable product according to claim 1 or 2 which includes one or more added solutes.

4. A vegetable product according to claim 3 wherein said solutes are selected from sodium chloride, potassium chloride, sodium lactate, potassium lactate, sodium citrate, glucose, sucrose, fructose, sorbitol and other water activity controlling solutes.

5. A vegetable product according to claim 1 having a moisture content from about 2% to about 12%.

6. A vegetable product according to claim 5 having moisture content from 4% to 6%.

7. A dehydrated vegetable product prepared by partially dehydrating vegetable pieces to a moisture content from about 8% to about 30%, compressing the vegetable pieces, and thereafter further dehydrating the vegetable pieces to a moisture content of about 12% or lower.

8. A method according to claim 7 wherein said vegetable pieces are dehydrated to a moisture content which is from about 8% to about 20%.

9. A method according to claim 7 wherein the vegetable pieces following compression have a substantially intact cellular structure which on being placed in water at a temperature of 90°C to 100°C is capable of rehydration substantially to its original fresh dimensions and is of edible tenderness and texture instantly or within five minutes.

10. A vegetable product according to claim 7 wherein the vegetable pieces are further dehydrated to a moisture content from about 2% to about 10%.

11. A process according to claim 7 wherein the vegetable produce has solutes added thereto.

12. A process for the preparation of a dehydrated, rapidly rehydrating, vegetable product by compression of a partially dehydrated vegetable product.

13. A process according to claim 12 where the partially dehydrated vegetable product is dehydrated to a moisture content from about 8% to about 30%.

14. A process according to claim 12 wherein the compressed vegetable product has a substantially intact cellular structure, and which on being placed in water at a temperature of 90°C to 100°C is capable of rehydration substantially to its original fresh dimensions and is of edible tenderness and texture instantly or within five minutes.

15. A process according to claim 12 wherein following compression the vegetable product is further dehydrated to a moisture content of 12% or lower.

16. A process according to claim 15 wherein said moisture content is from about 2% to about 10%.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU 99/00573

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: A23B 004/04; A23L 3/005

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
SEE BELOW

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
see below

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
ORBIT (WPAT): (VEGETABLE# or FRUIT#) and DEHYDRATE
STN (AGRICOLA and FSTA): (VEGETABLE# or FRUIT#) and DEHYDRATE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,Y	US 3950560 (RAHMAN et al) 13.04.76; see p5-6; claims 1-11.)	1-16
X,Y	US 3385715 (ISHLER et al) 28.05.68; see column 2, lines 45-59	1-16
X,Y	US 3806610 (RAHMANN et al) 23.04.74. see colums 1-2; claim 1	1-16

☐ Further documents are listed in the continuation of Box C

☒ See patent family annex

* Special categories of cited documents:

"A" Document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
25 August 1999

Date of mailing of the international search report
07 September 1999 (07.09.99)

Name and mailing address of the ISA/AU

AUSTRALIAN PATENT OFFICE
PO BOX 200
WODEN ACT 2606
AUSTRALIA
Facsimile No.: (02) 6285 3929

Authorized officer

MADHU K. JOGIA
Telephone No.: (02) 6283 2512

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU 99/00573

C (Continuation). **DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3038813 (CORDING et al) 12.06.62. see claims1 and 12	1-16
X	US 3408209 (ESKEW et al) 29.10.68. see claim 6	1-16
X	AU-B 42800/89 (BYRON et al) 26.04.90. see Examples 1-5; claims 1-12	1-16
X	EP 481923 (AGROFIL et al) 04.06.91. see claims 1-16	1-16
X	GB 576895 (MAGUIRE et al) 25.04.46. see Columns 1-2;	1-2
X	FOOD TECHNOLOGY, Vol 11 No. 6, pp 302-306 (1957). See Column 1	1-2
X	AU-B- 41680/96 (BYRON et al) 10.07.96. see p1-5, Examples 1-5; claims 1-15	1-16
Y	AU-B-58903/80 (BYRON et al) 15.01.81. see claims 5-8; Example 1	4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU 99/00573

Information on patent family members

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	3408209	BE	677467	CH	490807	DE	1692570
		NL	6603010				
AU	42800	CA	2000546	GB	2225521	JP	2257827
		NZ	230946				
EP	481923	AU	77059/91	CA	2043638	CN	1060588
		CS	9101682				
AU	41680	WO	9619113	EP	796044	GB	2310125

END OF ANNEX

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 737009/PS	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International Application No. **PCT/AU99/00573**	International Filing Date *(day/month/year)* 15 July 1999	Priority Date *(day/month/year)* 20 July 1998
International Patent Classification (IPC) or national classification and IPC **Int. Cl.** [7] A23B 004/04; A23L 3/005		
Applicant BYRON AUSTRALIA PTY LTD et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   [X] This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 2 sheet(s).

3. This report contains indications relating to the following items:

I	[X]	Basis of the report
II	[ ]	Priority
III	[ ]	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	[ ]	Lack of unity of invention
V	[X]	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	[ ]	Certain documents cited
VII	[ ]	Certain defects in the international application
VIII	[X]	Certain observations on the international application

Date of submission of the demand 1 February 2000	Date of completion of the report 16 November 2000
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer MADHU K. JOGIA Telephone No. (02) 6283 2512

I. Basis of the report

1. With regard to the **elements** of the international application:*

- [ ] the international application as originally filed.
- [X] the description, pages **1-8** , as originally filed,
  pages , filed with the demand,
  pages , received on with the letter of
- [X] the claims, pages , as originally filed,
  pages , as amended (together with any statement) under Article 19,
  pages , filed with the demand,
  pages **9,10** , received on **16 Nov 2000** with the letter of **16 Nov 2000**
- [ ] the drawings, pages , as originally filed,
  pages , filed with the demand,
  pages , received on with the letter of
- [ ] the sequence listing part of the description:
  pages , as originally filed
  pages , filed with the demand
  pages , received on with the letter of

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language which is:

- [ ] the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- [ ] the language of publication of the international application (under Rule 48.3(b)).
- [ ] the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, was on the basis of the sequence listing:

- [ ] contained in the international application in written form.
- [ ] filed together with the international application in computer readable form.
- [ ] furnished subsequently to this Authority in written form.
- [ ] furnished subsequently to this Authority in computer readable form.
- [ ] The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- [ ] The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. [X] The amendments have resulted in the cancellation of:
   - [ ] the description, pages
   - [X] the claims, Nos. **15,16**
   - [ ] the drawings, sheets/fig.

5. [ ] This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report*

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 1-14	**YES**
	Claims	**NO**
Inventive step (IS)	Claims	**YES**
	Claims 1-14	**NO**
Industrial applicability (IA)	Claims 1-14	**YES**
	Claims	**NO**

2. Citations and explanations (Rule 70.7)

The notations of the citations discussed below appear in the same order as that listed in the International Search Report.

<u>Novelty (N) and Inventive Step (IS) Claims 1-14</u>

The present invention relates to quick cooking dehydrated products. The invention appears to be characterised by features including a dehydrated vegetable product having moisture content of about 12%, partially dehydrating vegetable pieces to from 8-30%, compression of vegetable pieces, optionally further dehydration to achieve a moisture content of about 12%, placing of vegetable piece in water at a temperature of about 90-100°C and whereby the product retains its texture upon rehydration in water.

The applicant submits that with reference to D1, a compacted solid vegetable is described, which is inconvenient as to size, handling and appearance. Further, that the document does not disclose a vegetable piece as described in your specification at pages 3-4, compression in one dimension and that the product is not rehydrated within a short time.

It appears that the invention according to the amended claims defines a combination of novel features not disclosed in the art.

However, the invention appears to be obvious in the light of D1 and D5.

The problem faced by the skilled addressee is to produce a dehydrated vegetable product for instant use.

The invention appears to be taught in the citation **D1**(*Rahman et al; 1976*). This citation discloses a vegetable product with substantially the same cellular structure (page 7) as the original vegetable and whereby the product is subjected to reduction in moisture content of about 7-18% (page 5). Further, compression of the vegetable allows for the moisture content to remain between 7-18%. In regard to the rehydration step, the applicant submits that the citation **D1** describes a two-step process while the present invention involves a one step instant or very rapid rehydration/edible tender product. However, it appears that the disclosure at page 5 clearly produces a vegetable product capable of rehydration within a short time in boiling or near water. There appears to be no indication that the boiling and simmering is a continuous process or not (ie, one or multiple, eg two step).

..continued..

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claims 1, 5,7, 8, 9 and 13 at least are not clear because the scope of these claims is indefinite. The term "of about" does not define a specific upper or lower limit to enable the skilled addressee to determine the boundary of your invention. Furthermore, claim 2 is not clear because the term " and the like" does not limit the scope of the claim

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of Box V

Although the compression of the vegetable product may not be in one dimension according to the process in D1, the skilled addressee equipped with the common general knowledge in the art as taught by **Eskew et al** (*D5; US 3408209*) would be familiar with the use of rollers in the art as a means of compression of dehydrated vegetable products.

Therefore the invention as defined in claims 1, 2 and 4-14 is obvious and lacks an inventive step.

Further, the use of solutes is taught by **Lewis et al** (*D6;AU 42800/89*) and therefore the invention as defined in claims 2 and 3 lacks an inventive step.

Industrial Applicability (IA) Claims 1-14

The invention appears to possess industrial applicability.

Claims

1. A dehydrated shelf stable vegetable product which comprises a vegetable piece having a moisture content of about 12% or less, having a substantially intact cellular structure, prepared by partially dehydrating vegetable pieces to a moisture content from about 8% to about 30%, compressing the vegetable piece in one dimension, and optionally thereafter further dehydrating the compressed vegetable piece to a moisture content of about 12% or lower, wherein the vegetable piece when placed in water at a temperature of 90°C to 100°C without further application of heat is capable of rehydration substantially to its original fresh dimension and is of edible tenderness and texture instantly or within five minutes.

2. A vegetable product according to claim 1 wherein the vegetable is selected from carrots, peas, peppers, tomatoes, sweet corn, onion, squash, chillies, zucchini, mushroom, cabbage, celery, green beans, beetroot, pumpkin, and the like.

3. A vegetable product according to claim 1 or 2 which includes one or more added solutes.

4. A vegetable product according to claim 3 wherein said solutes are selected from sodium chloride, potassium chloride, sodium lactate, potassium lactate, sodium citrate, glucose, sucrose, fructose, sorbitol and other water activity controlling solutes.

5. A vegetable product according to claim 1 having a moisture content from about 2% to about 12%.

6. A vegetable product according to claim 5 having a moisture content from 4% to 6%.

7. A method according to claim 1 wherein the vegetable piece is dehydrated to a moisture content which is from about 8% to about 20%.

8. A vegetable product according to claim 1 wherein the compressed vegetable piece is further dehydrated to a moisture content from about 2% to about 10%.

9. A process for the preparation of a dehydrated, rapidly rehydrating, vegetable product which comprises partially dehydrating vegetable pieces to a moisture content from about 8% to about 30%, compressing the vegetable piece in one dimension, and optionally thereafter further dehydrating the compressed vegetable piece to a moisture content of about 12% or lower, wherein the vegetable piece when placed in water at a temperature of 90°C to 100°C without further application of heat is capable of rehydration substantially to its original fresh dimension and is of edible tenderness and texture instantly or within five minutes.

10. A process according to claim 9 wherein the vegetable is selected from carrots, peas, peppers, tomatoes, sweet corn, onion, squash, chillies, zucchini, mushroom, cabbage, celery, green beans, beetroot, pumpkin, and the like.

11. A process according to claim 9 wherein prior to compressing the vegetable piece in one dimension one or more solutes are added to the piece.

12. A process according to claim 11 wherein said solutes are selected from sodium chloride, potassium chloride, sodium lactate, potassium lactate, sodium citrate, glucose, sucrose, fructose, sorbitol and other water activity controlling solutes.

13. A process according to claim 9 wherein the compressed vegetable piece is dehydrated to a moisture content from about 2% to about 12%.

14. A process according to claim 13 wherein the vegetable piece is dehydrated to a moisture content from 4% to 6%.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 737009/PS	**FOR FURTHER ACTION**	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. **PCT/AU 99/00573**	International filing date *(day/month/year)* 15 July 1999	(Earliest) Priority Date *(day/month/year)* 20 July 1998

Applicant

1. BYRON AUSTRALIA PTY LTD et al

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of **4** sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (See Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☐ because the applicant failed to suggest a figure

☐ because this figure better characterizes the invention

☒ None of the figures

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/AU 99/00573

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	3408209	BE	677467	CH	490807	DE	1692570
		NL	6603010				
AU	42800	CA	2000546	GB	2225521	JP	2257827
		NZ	230946				
EP	481923	AU	77059/91	CA	2043638	CN	1060588
		CS	9101682				
AU	41680	WO	9619113	EP	796044	GB	2310125

END OF ANNEX

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU 99/00573

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: A23B 004/04; A23L 3/005

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
SEE BELOW

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
see below

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
ORBIT (WPAT): (VEGETABLE# or FRUIT#) and DEHYDRATE
STN (AGRICOLA and FSTA): (VEGETABLE# or FRUIT#) and DEHYDRATE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,Y	US 3950560 (RAHMAN et al) 13.04.76; see p5-6; claims 1-11.)	1-16
X,Y	US 3385715 (ISHLER et al) 28.05.68; see column 2, lines 45-59	1-16
X,Y	US 3806610 (RAHMANN et al) 23.04.74. see colums 1-2; claim 1	1-16

☐ Further documents are listed in the continuation of Box C

☒ See patent family annex

* Special categories of cited documents:

"A" Document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 August 1999	07 SEP 1999
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (02) 6285 3929	Authorized officer MADHU K. JOGIA Telephone No.: (02) 6283 2512

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3038813 (CORDING et al) 12.06.62. see claims1 and 12	1-16
X	US 3408209 (ESKEW et al) 29.10.68. see claim 6	1-16
X	AU-B 42800/89 (BYRON et al) 26.04.90. see Examples 1-5; claims 1-12	1-16
X	EP 481923 (AGROFIL et al) 04.06.91. see claims 1-16	1-16
X	GB 576895 (MAGUIRE et al) 25.04.46. see Columns 1-2;	1-2
X	FOOD TECHNOLOGY, Vol 11 No. 6, pp 302-306 (1957). See Column 1	1-2
X	AU-B- 41680/96 (BYRON et al) 10.07.96. see p1-5, Examples 1-5; claims 1-15	1-16
Y	AU-B-58903/80 (BYRON et al) 15.01.81. see claims 5-8; Example 1	4

SERIAL NUMBER : 09/744123

TO: PCT OFFICE OF FINANCE
CRYSTAL PLAZA 2 - 5TH FLOOR

FROM : PCT INTERNATIONAL DIVISION - DO/EO
CRYSTAL PLAZA 2 - 8TH FLOOR

PLEASE PROCESS THE FOLLOWING CORRECTIONS :

FROM		TO	
CODE	FEE	CODE	FEE
960	1000.00	961	500.00
968	270.00	969	135.00
154	130.00	254	65.00

OTHER :

☐ CHARGE VOUCHER IS ATTACHED TO CHARGE / REFUND ADDITIONAL FEES

☐ OTHER : $ 700.00

THE ORIGINAL METHOD OF PAYMENT WAS :

☐ BY A CHECK

☑ BY A CHARGE TO DEPOSIT ACCOUNT NO. 19-1013

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark Office
Box PCT
Washington, D.C.20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 21 February 2000 (21.02.00)	
International application No. PCT/AU99/00573	**Applicant's or agent's file reference** 737009/PS
International filing date (day/month/year) 15 July 1999 (15.07.99)	**Priority date** (day/month/year) 20 July 1998 (20.07.98)
Applicant LEWIS, Victor, Marcus et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

01 February 2000 (01.02.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Juan Cruz
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38